research by AID in 1980. A particularly significant increase is in energy research, scheduled to grow from \$3.4 million in 1980 to \$16.3 million in 1982.

The impact the increase in funds and the internal reorganization will have remains controversial. Those in Congress who argued most strongly for the institute are somewhat sceptical.

This scepticism is reflected in a report from the House Foreign Affairs Committee on the AID budget request, which has included as a separate item a proposed \$10 million (reduced from President Carter's requested \$18 million) for the support of scientific and technological cooperation with developing countries. The committee has reinserted this money into the broader category of "selected development activities".

In fact, much of this money will be spent in a way comparable to what the institute would have done, but through a different agency, the National Academy of Sciences. AID has agreed to provide \$35 million of its science and technology funds over the next five years to a new grants programme established under the academy's Board on Science and Technology for International Development.

The grants, which will be \$5 million for 1981 and increase to \$10 million by the middle of the decade, will be spent largely on supporting research activities in the developing countries on projects selected by an advisory board. "One of our principal goals is to help developing countries build up their research capabilities, precisely the request that they were making at UNCSTD (the United National Conference on Science and Technology for Development) in Vienna in 1979", says the board's staff director, Dr Victor Rabinowitch.

When the grants programme is added to its more traditional activities, such as arranging seminars on Third World problems, the board will begin to resemble a scaled-down version of the Institute for Scientific and Technological Cooperation.

Furthermore its relative autonomy from AID goes some way to meeting the objections of those who argued that, as put forward by the Carter Administration, the inclusion of the institute under the umbrella of development aid bodies would have stifled its flexibility. **David Dickson**

Polish economic reform

Self-governance wins

Warsaw

The latest Polish plans for economic reform, discussed in considerable detail during the recent extraordinary Party congress, include a major shake-up for Polish science and technology. The basis of the proposed new economic model is a switch from rigid central planning of industrial production to a degree of "self-governance" (*samorządność*) — a word introduced into the Polish political lexicon

with the rise of the independent trade union movement last August.

The new system, which is to be introduced in four phases over the next 18 months, will allow for more public and expert discussion in advance of overall production plans and delegate to factories initiative for deciding how they fit in with the overall targets.

As in Hungary, the authorities will steer production by a system of financial incentives, but factory managements will have considerable responsibility for decision-making on modernization and technological innovation. One of the major charges laid against the previous Gierek government in the preamble to the new plan is that autocratic planning blocked technical innovation. At the same time, many of Mr Gierek's prestigious schemes are being dropped. The "Program-Wisla", for example, which was totally to remodel Poland's major waterway by the end of the century, has been cut back to its environmental and agricultural components. The schemes for hydroelectric dams and the straightening of rivers have been dropped *sine die*.

Other harm done by Gierek's policies will not be so easily remedied. Discrimination against the private farmer in the pricing and supply system ran agriculture down to a level where even the new rationing system cannot ensure supplies of basic home-produced foods. The abolition of the small pharmaceutical cooperative factories in the 1970s has meant that Poland has had to shop abroad for a wide variety of drugs whose production runs were too small for the state pharmaceutical enterprise Polfa — and when hard currency ran out, so did the supply of even the most essential drugs. The international relief operation to ensure vital supplies now being mounted jointly by Solidarity and the Polish Ministry of Health is a strange contrast with the anxiety in the mid-1960s in the United Kingdom that Polish drugs might undercut the domestic products.

Although the new plan pays lip-service to the strengthening of scientific and technical ties with other (especially Comecon) countries, it is also clear that for the present Poland will have to rely mainly on home-based technology.

A reorganization of the responsible ministries is also on the cards. One is for a State Committee for Technical Progress responsible to the Prime Minister. The new body would be unique in the Comecon bloc in dealing only with technology, and may point to an ultimate break-up of the Ministry of Science, Higher Education and Technology. Straws in the wind include the appointment last month of a mining specialist, Jerzy Nawrocki, as Minister of Science, Higher Education and Technology, and the plans discussed at the congress for a complete review of the country's industrial research institutes and the closure of those not cost effective.

Whatever the final form of the reorgani-

zation, one change is certain — a revision of the present practice of financing science by "problems" ostensibly related to economic needs and organized into a cumbersome hierarchy of priorities. Among likely innovations are direct research contracts between industry and the universities or academy institutes and the allocation of funds for basic research directly to the institutions concerned.

For the moment, however, virtually all such funding will come in non-convertible zloty. Hard currency for the purchase of equipment, reagents or journals from the West is simply not to be had; according to one leading physicist, only two subscriptions to *Nature* are now authorized for the whole of Warsaw. **Vera Rich**

British Technology Group

Mixed marriage

Last week, Britain's National Enterprise Board and the National Research Development Corporation finally merged. The British Technology Group, as the two are now called, has been in the office since Sir Frederick Wood was appointed chairman of both the board and the corporation at the beginning of the year. His plan for a merger has now been accepted by the government, although legislation to give the group formal status will not be possible until 1983.

The plan is that the group will offer more streamlined services to innovators seeking backing for their ventures than either of the parent organizations. The merger will also eliminate competition between the board and corporation for the same projects.

The function of the former corporation to support research and development into potentially marketable innovations will be largely taken over by the group's technology transfer division. And the board's experience in raising finance to invest in industry will be incorporated into the new investment and operations divisions, the latter being responsible for returning investments to the private sector.

Both parent organizations have been widely criticized in the past. The board, which was originally set up in 1965 by the then Labour government with the potent title of Industrial Reconstruction Corporation, has since been substantially curtailed. And the corporation has been criticized mainly by academics for not being adventurous enough in supporting their innovations and persuading industry to take them up. The British Technology Group is intended primarily to marry the corporation's access to innovators with the board's financial expertise. There is to be a new liaison team whose prime responsibility will be to scour the universities more aggressively than in the past.

The group is also to have a new corporate development unit to develop strategies for investment. Areas of priority are advanced manufacturing and biotechnology. A

study team on robotics has already presented a strategy paper to the group which is expected to result in investments within the next few months. The group also has plans for investing in biotechnology in areas not covered by Celltech, the company set up by the board last year.

As yet the group does not know precisely how much public money it will have to spend. The precise structure of the new organization should become clearer in September.

Judy Redfearn

Tidal energy

The big dam

The economic feasibility of a tidal barrage for generating electricity across the Severn estuary in south-west England will depend on how many nuclear power stations are attached to the national grid. In most circumstances, however, a barrage would be a good investment, according to a report by the Severn Barrage Committee published last week. The committee, set up in 1978 under Sir Hermann Bondi, then chief scientist at the Department of Energy, and whose deliberations have cost £2.3 million, has also concluded that a barrage is technically feasible but has called for detailed studies of its potential environmental, industrial and social impact.

The outlook for a barrage across the Severn estuary, which has one of the greatest tidal ranges in the world, has improved considerably in the past two years, according to the committee. Approximately 40 per cent more energy should be obtainable from an inner barrage, the scheme favoured by the committee, than was originally thought. And electricity generation should be possible nine rather than 16 years after the start of construction.

The committee estimates that the most cost-effective scheme would cost about £5,600 million and would generate 13 TWh a year from an installed capacity of 7,200 MW. That scheme is for an inner barrage from Brean Down to Lavernock Point consisting of large prefabricated concrete units housing turbines and sluices. A more ambitious barrage built further out to sea, costing £8,900 million and generating 20 TWh from 12,000 MW capacity, would be less economic and involve greater risk during construction. The inner barrage scheme, on which the committee has based most of its calculations, has the added advantage that a second barrage could be added at a later stage. The two together would provide as much energy as the outer barrage at a similar overall cost.

Because of the variability in tidal energy, a barrage would reduce the need for other generating capacity only by about 1,000 GW, according to the committee, most savings being in fossil fuel. And as nuclear power is also capital-intensive and low on fuel costs, the attractiveness of a barrage will to a large extent depend on future plans

for nuclear power. Under the Central Electricity Generating Board scenario, which assumes a fairly rapid growth in nuclear power stations, the barrage is marginally unattractive, says the committee. But it could provide an attractive alternative if nuclear plans are modified only slightly.

The committee seems convinced that a Severn barrage should at least be seriously considered as a possible alternative to investment in nuclear power. Before a decision is finally taken, however, it recommends further studies of the effects on water levels, wildlife and local amenities and the capacity of British industry to cope with such a project. If the government decides to take investigations further, the next step should be an acceptability and preliminary design study costing £20 million and the building of prototype concrete units at a cost of £25 million.

Judy Redfearn

US nuclear weapons

Lasers purify

Washington

A Washington environmentalist group is trying to prevent the Department of Energy from carrying out an expanded programme of research into laser isotope techniques for separating plutonium for US nuclear weapons from spent nuclear fuel.

A classified research programme into laser isotope separations, using copper vapour lasers for uranium enrichment, has been carried out at a relatively low level of funding at the Department of Energy's Lawrence Livermore National Laboratory and the Los Alamos National Laboratory since the mid-1970s — in both 1980 and 1981 total funding for the programme was \$5 million.

In testimony before a congressional committee in March which has just been declassified, the Department of Energy requested an increase in funds to \$155 million over the next three years to support this research and its application to plutonium enrichment. This money would include the construction of a pilot plant, and the department is also discussing plans to construct a \$200 million multipurpose plutonium isotope production plant.

In a letter sent last week to the Secretary of Energy, Mr James Edwards, a staff scientist and an attorney with the Natural Resources Defense Council say that the plutonium laser isotope separation programme "carries grave nuclear weapons proliferation risks" and is "totally inconsistent with the fundamental objective of President Reagan's nuclear non-proliferation policy".

They point out that although the department has identified several other applications for the process — such as the enrichment of fuel-grade plutonium as fuel for the breeder reactor research programme — "it appears that these applications would not serve as adequate justification for the program, particularly in light of the severe proliferation dangers".

In their presentation to the congressional committee, Department of Energy officials said that the purpose of the expanded programme was to make available for weapons use approximately 70 tonnes of plutonium by reprocessing commercial spent fuel and then enriching the plutonium to weapons-grade by laser isotope separation. It would be possible to convert fuel-grade plutonium produced by the department's nuclear reactor in Hanford, Washington, to weapons-grade.

One of the purposes of the laser isotope separation process is to enrich plutonium to weapons grade by reducing the concentration of the major contaminant isotope Pu-240, which is not spontaneously fissile. According to testimony given to Congress by F. Charles Gilbert, assistant secretary for nuclear materials at the Department of Energy, plutonium is placed in one of four categories depending on the concentration of the Pu-240 contaminant: reactor-grade for 19 per cent or greater, fuel-grade for between 7 and 19 per cent, weapons-grade for less than 7 per cent, and supergrade for between 2 and 3 per cent.

The laser enrichment process has two non-military uses. The first is the separation of the Pu-238 isotope, which is used in space satellites and heart pacemakers, as well as for a heat source in thermoelectric generators. The second is the separation of the Pu-241 isotope which decays to Am-241 which is used in smoke detectors and for logging wells. According to the Department of Energy, the non-weapons applications at present require less than two per cent of the output of the Savannah River plant, which is the current source of supergrade plutonium.

David Dickson